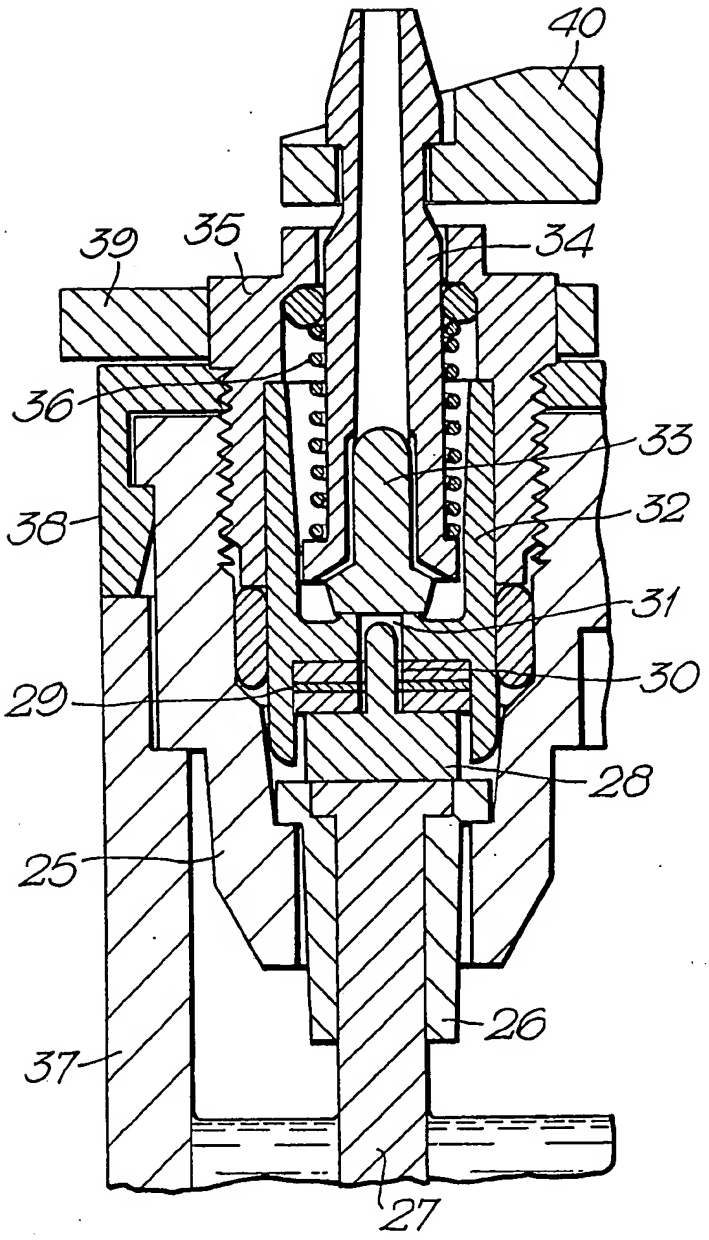
431/344

Fig. 3.



European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 0349

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	US-A-3 132 499 (ROGERS) * Column 2, lines 13-48; figures *	1,5,6	F 23 Q 2/16
A	FR-A-2 416 937 (VOSGANIANTZ) * Page 5, lines 31-33; page 10, lines 1-22 *	1,2	
A	PATENT ABSTRACTS OF JAPAN, vol. 4, no. 171 (M-44)[653], 26th November 1980; & JP-A-55 121 326 (MATSUSHITA DENKI SANGYO K.K.) 18-09-1980	1	
A	FR-A-2 247 668 (DUPONT) * Page 9, lines 1-13 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

F 23 Q

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	17-04-1989	VANHEUSDEN J.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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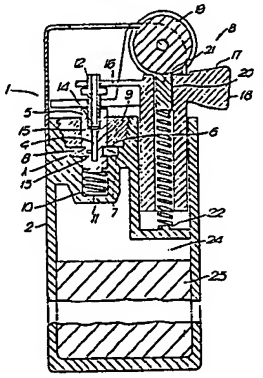
(54) Gas lighter.

(57) A gas lighter includes a valve mechanism (A) for releasing a fuel gas at a fixed rate, the gas evaporating from a solid phase fuel of a liquefied petroleum gas contained sealingly within a fuel chamber (24) of the gas lighter. The valve mechanism (A) includes a nozzle (12), a nozzle holder (5) for receiving the nozzle (12), and a flow regulation means interposed between an intake part of the nozzle (12) and a gas passage of the holder (5). The flow regulation means is formed of an orifice plate (15) provided with a central orifice of a predetermined diameter so as to allow the gas lighter to provide a desired flame height.

Fig.1.



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Description

GAS LIGHTER

The present invention relates to a gas lighter.

Japanese Patent Laid-Open Publication 61-283693 discloses a recently developed solid-phase composite of liquefied petroleum gas to be used as a fuel for a gas lighter, which composite comprises (a) a liquefied gas, (b) a solvent mixture which is intersoluble with a solidification agent and with the liquefied petroleum gas, (c) an aprotic solvent, and, (d) a small amount of resin added in the solvent mixture.

A known nozzle valve mechanism of a gas lighter for releasing the atomized fuel gas, is illustrated in Fig. 3 of the accompanying drawings, and includes an outer tubular casing 25, a sintered core 27 having a heat collector tube 26 supportingly received in a lower part of the outer tubular casing 25, a core spacer 28 disposed on the sintered core 27 and having a central projection, and a centrally bored filter member 29 of a polyurethane foam or of a compressed felt loosely fitted around the projection of the spacer for regulating the release or output of the fuel gas controlling the flame. The mechanism also includes a nozzle holder 32 having an intake port 31 communicating with a gas passage 30 and disposed in the casing 25 for receiving the filter member, a nozzle 34, a rubber valve 33 to open and close the intake port 31, both disposed in the holder 32, a burner regulation tube 35 fit peripherally on the nozzle holder 32, and a compression spring 36 extending between an outer lower flange of the nozzle 34 and an inner upper flange of the burner regulation tube 35. The outer tubular casing 25 is secured to a body 37 of the lighter by an intermediate casing 38. The burner regulation tube 35 is provided with a control lever 39, and the nozzle 34 is raised upwardly with a pull lever 40 connected to its upper end.

Japanese Patent Laid-Open Publication 51-148576 discloses an improved nozzle valve mechanism including a fuel pressure control unit. The disclosed fuel pressure control unit includes an upstream wet chamber, a downstream atomizing chamber, and at least one filter formed of a porous thin film being suitably wetable with hydrocarbon and disposed between the two chambers. The filter has a degree of porosity which is determined in compliance with a suitable flow rate of the fuel gas corresponding to the required flame height.

If the above-mentioned solid-phase composite of the liquefied petroleum gas is utilized in the former nozzle valve mechanism of the gas lighter of Fig. 3, the mechanism fails to control the flame height in a stable manner due to non-uniformity or transitional variance in the permeability of the filter member and hence the size of the pores in the filter material such as the polyurethane foam and the compressed felt which change the flame condition and are apt to cause insufficient heat for evaporation. Thus the disclosed mechanism has drawbacks in that it fails to provide a stable flame height when the lighter is lit at a relatively low temperature and/or it is operated continuously in time, and in that the mechanism has the increased number of components which increases the manufacturing cost.

The latter nozzle valve mechanism has also drawbacks in that the filter formed of a thin film of polypropylene or polyethylene is also apt to undergo the objectionable transitional variance in quality and that the film is too thin, namely approximately 100 micrometers, to be handled with ease. This mechanism has a further drawback in safety in that with a fuel used in a liquid phase, the burning condition often changes suddenly or otherwise the liquid fuel leaks when the position of the lighter body is changed.

An object of the present invention is to obviate or mitigate the aforesaid disadvantages.

According to the present invention, there is provided a gas lighter comprising:

a lighter body having a fuel chamber for receiving and holding a solid fuel composition incorporating a liquefied petroleum gas;

a valve mechanism for releasing gaseous fuel from the fuel chamber;

an ignition unit for igniting fuel flowing from the valve mechanism and operatively connected to the said mechanism;

characterised in that said valve mechanism includes an orifice plate having an orifice of predetermined fixed diameter of from 30 to 70 micrometers for restricting the flow rate of gas from the fuel chamber.

The invention will now be described, by way of illustration, with reference to the accompanying drawings, of which:-

Fig. 1 is a vertical cross-sectional view of a gas lighter according to the present invention;

Fig. 2 is a graph showing a relation between an inside diameter of an orifice and a flame height; and

Fig. 3 is a vertical cross-sectional view of a nozzle valve mechanism of a known lighter for supplying a vapored gas.

As shown in Fig. 1, a gas lighter 1 includes a valve mechanism A for releasing a fuel gas, an ignition unit B for igniting the released gas, and a gas lighter body 2 for supporting the valve mechanism A and the ignition unit B.

The valve mechanism A is vertically movable and located in a recess 3 formed in an upper portion of the body 2. The valve mechanism A includes a nozzle holder 5 having an axial gas passage 4 and a peripheral groove 6 extending on an intermediate portion of the holder, a nozzle 12 mounted in an upper end portion of the nozzle holder 5 and having an elongate passage 4 formed therein. A thin metal plate 15 is disposed between the nozzle holder 5 and the nozzle 12 and has an orifice 14 of a diameter 50 micrometers disposed in registry with the elongate and axial passages 4. The valve mechanism further includes a lateral bore 13 communicating the peripheral groove 6 with the axial gas passage 4. A

resilient valve 8, eg. of rubber, is provided in the peripheral groove 6 and locates also in a stepped portion formed in an intermediate part of the nozzle holder 5. A threaded valve retainer 9 is provided in an upper threaded portion of the recess 3. An intake port 11 is formed in a bottom wall of the recess 3 for communicating an inner space defined in the recess 3 with a fuel chamber 24 (described later). The mechanism also includes a compression spring 10 extending between the bottom wall of the recess 3 of the body 2 and the lower end of the nozzle holder 5 for urging the latter upwardly.

Importantly, the maximum height of the flame is determined by the diameter of the orifice 14 which controls the amount of the fuel gas flow.

The ignition unit B is disposed adjacent to the top end of the nozzle 12. The ignition unit B includes a guide body (not numerated) supported by the lighter body 2, an actuator 18 disposed at the upper end of the guide body, an abrasive wheel 19 rotatably supported on the lighter body, and a flint 21 located in a guide passage of the guide body. A compression spring 22 is also disposed in the guide passage for normally biasing the flint 21 upwardly against the wheel 19. The actuator 18 has a retainer arm 16 operatively connected to the nozzle 12 and a manually operable actuator lever ie. a finger tab 17 formed of a protrusion extending from the actuator 18.

The fuel chamber or container part 24 forms most of the lower part of the lighter body 2, the chamber 24 defining a closed space for confining a solid-phase fuel 23 of liquefied petroleum gas. A mixture of 7 parts by weight sodium stearate and 2 parts by weight rosin or glyceric ester is first introduced through the nozzle 12 of the valve mechanism A into the chamber 24, in which the mixture is sealed and confined in a gas tight and pressure resistant condition, and then a liquefied petroleum gas consisting of the mixture of 10% propane, 30% isobutane and 60% normal butane is charged through the nozzle 12 into the fuel chamber 24 under the pressure equal to or greater than the vapor pressure of the liquefied petroleum gas. The lighter body 2 is agitated to mix the liquefied petroleum gas with the previously charged mixture at room temperature thereby to form a gas-phase composite of said mixture and the liquefied petroleum gas.

A preferred blending ratio is that of 30 parts by weight of the liquefied petroleum gas to 4 to 8 parts by weight sodium stearate and 1 to 3 parts by weight rosin or glyceric ester.

If less than 4 parts by weight of sodium stearate is used, the liquefied petroleum gas fails to be dispersed sufficiently thus causing the sodium stearate to be precipitated.

Less than 1 weight part of the rosin or glyceric ester would result in a solid phase with insufficient strength, with the result that sodium stearate would be dispersed in the form of dust or powder within the fuel chamber 24, thereby clogging the intake port 11 and the orifice 14 of the valve mechanism A. With the glyceric ester of more than 3 weight parts used, the degree of solidification of the resulting composite cannot be increased.

In the above described embodiment, the solid-phase composite or fuel is formed by agitating the mixture of sodium stearate and rosin (or glyceric ester) with the liquefied petroleum gas consisting mainly of propane and butane within the sealed or confined chamber 24. Alternatively, the mixture and the liquefied petroleum gas may be charged together into a separate pressure resistant container and then stirred to be mixed with each other to form the solid-phase fuel composite. The solid-phase composite may then by cut into pieces of a desired size under a suitable pressure prohibiting vaporization of the composite.

Isobutane of purity 95% or more may be used as the liquefied petroleum gas.

With this arrangement, the liquefied petroleum gas is stored in the form of solid-phase composite in the chamber 24 and vaporises from the surface of the composite. The vaporised fuel or gas escapes as a jet out of the nozzle 12 of the valve mechanism A and then it is ignited by the ignition unit B in the conventional manner. The fuel thus stored in the chamber 24 has a very poor or no fluidity.

A flame height of the gas lighter according to the present invention is determined by the diameter of the orifice 14 which regulates the amount of the fuel gas passing therethrough. The flame height was measured at various sizes in diameter of the orifice 15. The results are shown in Table 1 and a graph is shown as Fig. 2.

TABLE 1

Relation between orifice diameter & flame height

No	Orifice dia. (μm)	Flame height 24°C (mm)	Flame height 5°C (mm)
1	33	20	9
2	38	31	16
3	42	31	16
4	45	31	16
5	45	30	17
6	48	42	22
7	50	48	27
8	50	55	30
9	55	52	30
10	57	51	33
11	58	55	31
12	58	63	33
13	62	80	41
14	65	75	42
15	70	92	50
16	71	100	53
17	74	95	50
18	77	90	50
19	80	100	60
20	80	100	55

Table 1 and Fig 2 show test results with respect to the relation between the diameter of the orifice and

the flame height. When the orifice has a diameter of less than 30 micrometers, the resulting flame height is too short to light a cigarette properly. When the orifice has a diameter of more than 70 micrometers the resulting flame height is more than 90 mm, which is too large for safe operation. An orifice of such a large diameter is dangerous for the user of the gas lighter. A most suitable diameter was 45 micrometeres at which the flame height was approximately 30mm at the temperature of 24 degrees centigrade.

It has been observed in the test that the higher the atmospheric temperature becomes, the shorter the resulting flame height becomes, or the vice versa.

With the orifice of the diameter of 50 to 70 micrometers, the flame height of approximately 50 to 100mm at maximum is obtained as shown in Table 1 and the graph. An adjustable filter or a valve disposed at an upstream or downstream side of the orifice for adjusting the amount of the fuel gas passing through the latter will provide a gas lighter which increases the flame height up to the maximum value determined by the orifice diameter.

The gas lighter having the valve mechanism A according to the present invention operates as described herein below.

The wheel 19 is first manually rotated by the user of the lighter while holding down the actuator 18, whereupon the nozzle 12, operatively connected to the actuator via the retainer arm 16, is pulled downwardly to allow the liquefied petroleum gas derived from the solid-phase fuel 23 to escape therefrom. At this time the wheel 19 causes friction on the flint 21 to strike a spark for igniting the gas. The gas lighter provides the flame height of the predetermined value depending on the diameter of the orifice 14. When the orifice is of 50 and 60 micrometers diameter, for instance, the flame height of 48mm and 75mm are obtained, respectively, at the temperature of 24 degrees centigrade. To extinguish the lighter, the actuator 18 is released to let the nozzle 12 return to the initial position shown in fig. 1, where the gas supply is stopped by the valve mechanism A.

With the arrangement described hereinabove, the gas lighter according to the present invention utilizes the solid-phase fuel composite of the liquefied petroleum gas without causing the foregoing problems, and has a valve mechanism for assuring a stable flame height of a predetermined value set at the time of manufacturing the gas lighter. The gas lighter provides the stable flame height which is not sensitive to insufficient evaporation heat and transitional variance irrespective of the operational condition such as operation time and the atmospheric temperature.

The present gas lighter is also advantageous in safety in that the amount of the fuel gas supply is always kept at a predetermined value determined by the orifice diameter of 30 to 70 micrometers irrespective of the operational position of the lighter body. Thus the flame height does not change even when the lighter body is held upside down nor the gas leakage takes place.

Elimination of some components such as a gas-flow control lever, a sintered core for evaporating the fuel and a heat collecting tube has simplified the construction of the lighter as a whole, which achieves a decreased manufacturing cost.

It should be noted that this invention is not limited to the described embodiment and modifications and changes may be made without departing from the scope of the invention.

Claims

1. A gas lighter comprising :
a lighter body (2) having a fuel chamber (24) for receiving and holding a solid fuel composition incorporating a liquefied petroleum gas;
a valve mechanism for releasing gaseous fuel from the fuel chamber (24);
an ignition unit for igniting fuel flowing from the valve mechanism and operatively connected to the said mechanism;
characterised in that said valve mechanism includes an orifice plate (15) having an orifice of predetermined fixed diameter of from 30 to 70 micrometers for restricting the flow rate of gas from the fuel chamber (24)

2. A gas lighter according to Claim 1, wherein the solid fuel composition comprises 30 parts by weight of liquefied petroleum gas, from 4 to 8 parts by weight of sodium stearate and from 1 to 3 parts by weight of rosin or glyceric ester.

3. A gas lighter according to Claim 2, wherein the liquified petroleum gas is a mixture of propane and butane.

4. A gas lighter according to Claim 2, wherein the liquefied petroleum gas is isobutane of purity 95 % or more.

5. A gas lighter according to any preceding Claim, wherein the orifice has a diameter of 50 micrometeres.

6. A gas lighter comprising:
a lighter body (2) having a fuel chamber (24) for receiving and holding a solid fuel composition incorporating a liquefied petroleum gas;
a valve mechanism for releasing gaseous fuel from the fuel chamber (24);
an ignition unit for igniting fuel flowing from the valve mechanism and operatively connected to the said mechanism;
wherein the valve mechanism is seated and axially movable within a recess (3) formed in the body (2), and includes:
a nozzle holder (5) having an axial throughpassage (4);
a resilient valve (8) disposed intermediate the ends of the nozzle holder (5), located within a peripheral groove (6) therein and abutting a shoulder provided in the recess (3);
a compression spring (10) acting between the floor of the recess (3) and said nozzle holder (5) biasing said valve (8) to the closed position;
a gas delivery port (11) formed in the floor of said recess (3);
a nozzle (12) located at an end of the holder (5);
a bore communicating the peripheral groove (6)

and the axial throughpassage; and
an orifice plate (15) interposed between the nozzle holder (5) and the nozzle (12) and having an orifice registering with the axial throughpassage;
and wherein the ignition unit is operatively connected to the valve mechanism and includes:

a nozzle actuator (18) engaging the nozzle (12) and a manually operable actuator lever (17) extending therefrom; and
an abrasive wheel (19) rotatably mounted on the body (2) and in contact with a flint (21), located in a flint guide bore and urged against the wheel (19) by a spring (22).

Fig.1.

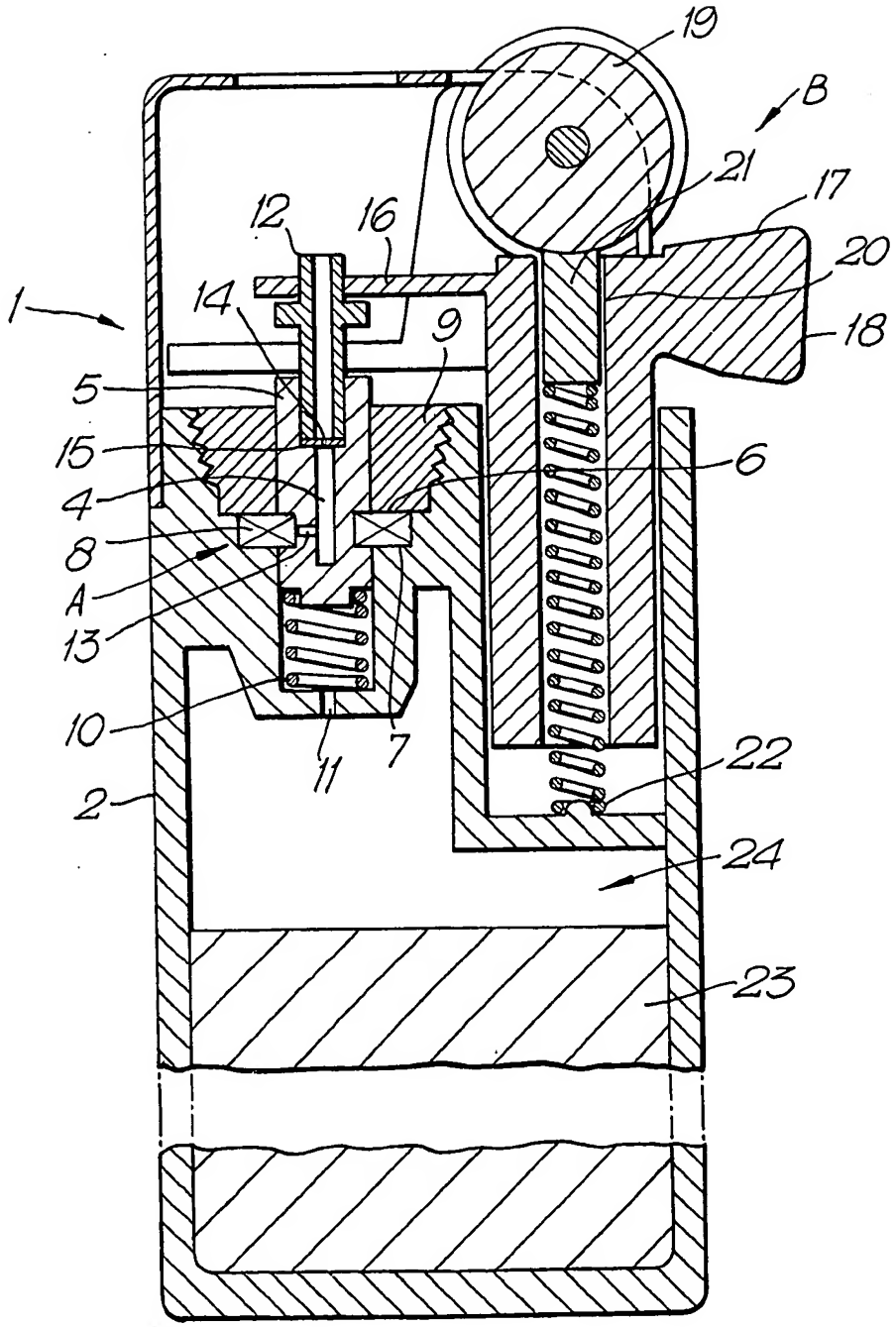
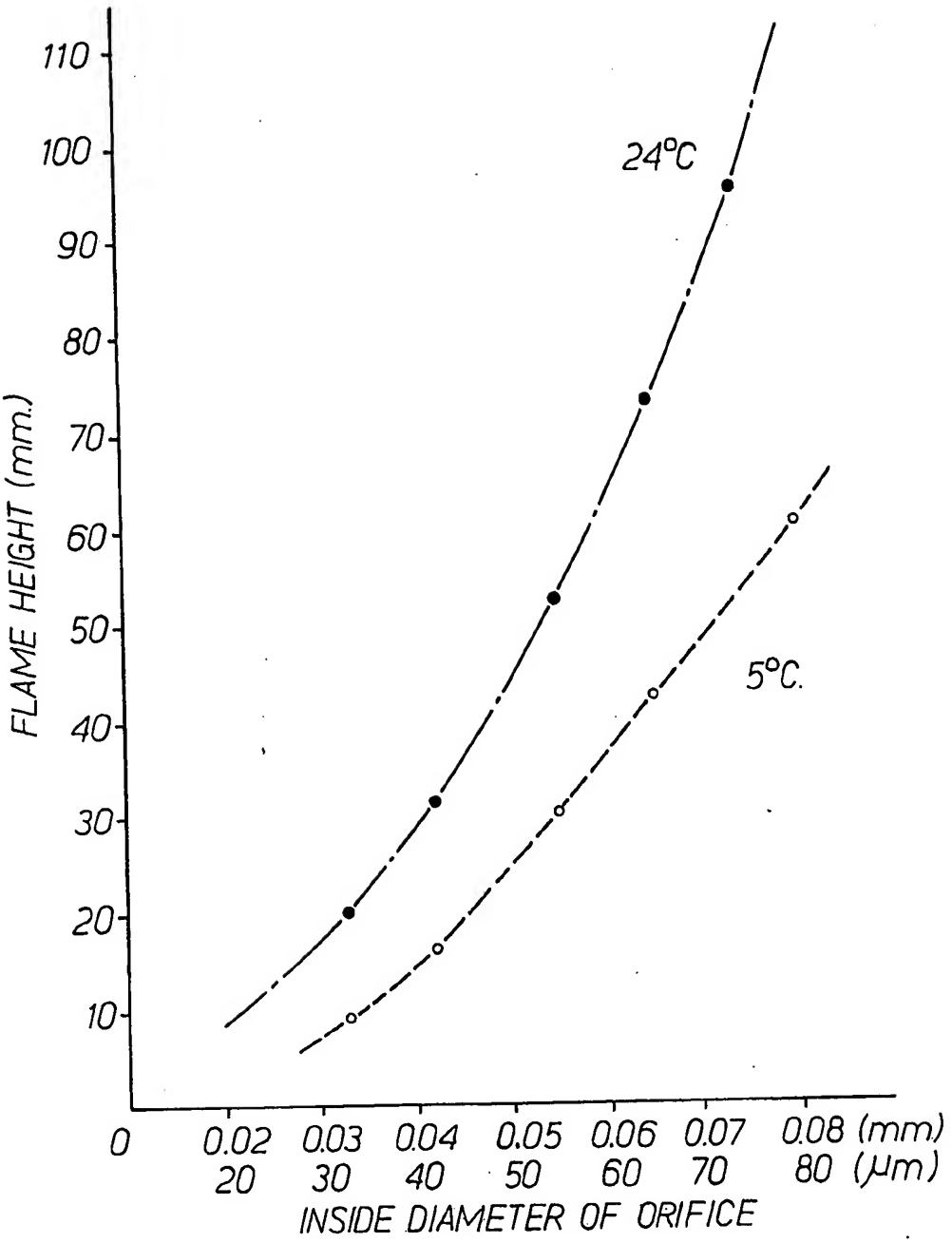


Fig. 2.


110
100
90
80
70
60
50
40
30
20
10
FLAME HEIGHT (mm.)
24°C
5°C.
0
0.02
20
0.03
30
0.04
40
0.05
50
0.06
60
0.07
70
0.08 (mm)
80 (μm)
INSIDE DIAMETER OF ORIFICE